

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 09-201590

(43)Date of publication of application : 05.08.1997

(51)Int.Cl.

C02F 1/74
B01J 21/10
B01J 23/30
B01J 23/42
B01J 23/44
B01J 23/46
B01J 23/46
B01J 23/52
B01J 23/72
B01J 23/745
B01J 23/75
B01J 23/755
B01J 27/057
B09B 5/00
C02F 1/58
C02F 1/58
C02F 1/58
C02F 11/08

(21)Application number : 08-012230

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(22)Date of filing : 26.01.1996

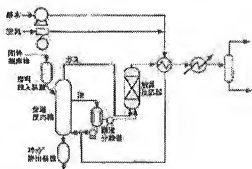
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(54) SIMULTANEOUS TREATMENT OF ORGANIC SOLID WASTE AND LIQUID WASTE

(57)Abstract:

PROBLEM TO BE SOLVED: To collectively treat org. solid waste and water with high decomposition efficiency and to recover power or heat energy.

SOLUTION: This treatment method is composed of a process of subjecting a liquid mixture of org. solid waste and liquid waste to wet oxidation treatment in the presence of oxygen in a first reactor at 100° C or higher while holding pressure keeping a liquid phase, a process of removing formed sludge and/or a metal component from the first reactor, a process of subjecting a high temp. and high pressure treated liquid to gas-liquid separation, a process of removing sludge and/or a metal component from the liquid phase and mixing a part of the liquid phase with the liquid waste to circulate the same to the first reactor and a process of subjecting the remainder of the liquid phase and the gas phase to catalytic wet oxidation treatment at liquid linear velocity of 0.1cm/sec or more at 100° C or higher under pressure keeping a liquid phase.



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CLAIMS

[Claim(s)]

[Claim 1](1) [in the first reactor] — a liquid mixture of organic solid waste and liquid waste — temperature of not less than 100 °C — and, maintaining at a pressure which maintains the liquid phase, A process which carries out a wet oxidation process under existence of oxygen more than the amount of theoretical oxygen required to disassemble a cyanide compound, a nitrogen compound, an organic nature substance, and an inorganic substance in a liquid mixture, (2) A process of removing sludge and/or a metallic component which were generated at a process of the above (1) from the first reactor, (3) A process of carrying out vapor liquid separation of the treating solution of high temperature high pressure obtained at a process of the above (1), (4) After removing sludge and/or a metallic component from the liquid phase acquired at a process of the above (3), while mixing a part of liquid phase with said liquid waste and circulating to the first reactor, the remainder of the liquid phase — the following — a process fed into a process of (5), and (5) — in the second reactor, The gaseous phase acquired at the remainder of the liquid phase and a process of the above (3) which were removed in sludge and/or a metallic component at a process of the above (4), Maintaining at a pressure to which it is 0.1 cm/sec or more in liquid linear velocity (feeding volume / reactor cross-section area), and not less than 100 °C in temperature, and a treating solution maintains the liquid phase under existence of a catalyst which uses at least one sort of metal and metallic compounds as an active ingredient. A concurrent processing method of organic solid waste and liquid waste provided with a process which carries out a catalyst wet oxidation process.

[Claim 2] A concurrent processing method of organic solid waste according to claim 1 and liquid waste whose quantity of the liquid phase through which it circulates from a process (4) to the first reactor is 5 or more times of quantity of the liquid phase fed by process (5) from a process (4).

[Claim 3] A concurrent processing method of organic solid waste according to claim 2 and liquid waste whose quantity of the liquid phase through which it circulates from a process (4) to the first reactor is 10 to 20 times the quantity of the liquid phase fed by process (5) from a process (4).

[Claim 4] A catalytic activity ingredient in a process (5) Iron, cobalt, nickel, a ruthenium, A concurrent processing method of organic solid waste according to any one of claims 1 to 3 and liquid waste which are at least one sort chosen from a group which becomes water of rhodium, palladium, iridium, platinum, copper, gold, tungsten, and these metal from an insoluble thru/or poorly soluble compound.

[Claim 5] A concurrent processing method of organic solid waste according to any one of claims 1 to 4 and liquid waste which perform recovery of power and/or a steam, or warm water from mixed gas of a steam and exhaust gas which were separated from liquid at the second reactor exit.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] this invention — organic solid waste (garbage, paper, a plastic, a piece of wood, and a bamboo piece.) It is related with the method of processing simultaneously the piece of grass, straw, textiles, vegetable pieces, rubber, a hide, etc. and liquid waste (sludge, such as aerobic treatment sludge, anaerobic-treatment sludge, and a sewage sludge; waste water, such as waste water from a domestic waste, a food factory, etc., and industrial waste water in which biological waste treatment contains a difficult ingredient etc.).

[0002]

[Description of the Prior Art] The solid waste which contains sludge, various waste water, and an organic matter conventionally is processed by the separate art according to each characteristic.

[0003] For example, sludge is incinerated after drying or reclamation processing is carried out. After activated sludge treatment of the organic matter content waste water is carried out, the sludge to generate is destroyed by fire or reclamation processed as mentioned above. The solid waste containing an organic matter remains as it is, or is incinerated after desiccation.

[0004] However, the yield of various kinds of [in recent years] wastes increases, and it is difficult to cope with it gradually in the method of processing individually by the above conventional technologies.

[0005]

[Problem(s) to be Solved by the Invention] Therefore, this invention primarily aims to provide the new art in which electric power, thermal energies, etc. can be collected while it bundles up organic solid waste and waste water and can process them with high decomposition efficiency.

[0006]

[Means for Solving the Problem] this invention person started research about art of processing sludge, various waste water, and organicity solid waste etc., in view of the actual condition of the above art. In the process, organic solid waste and liquid waste were mixed and it found out that above-mentioned SUBJECT could be mostly attained for this under a specific condition a wet oxidation process and when carrying out a catalyst wet oxidation process.

[0007] That is, this invention provides how to process following organic solid waste and liquid waste simultaneously;

(1 — the [1] — [in a reactor of one] — a liquid mixture of organic solid waste and liquid waste — temperature of not less than 100 °C — and, maintaining at a pressure which maintains the liquid phase. A process which carries out a wet oxidation process under existence of oxygen more than the amount of theoretical oxygen required to disassemble a cyanide compound, a nitrogen compound, an organic nature substance, and an inorganic substance in a liquid mixture, (2) A process of removing sludge and/or a metallic component which were generated at a process of the above (1) from the first reactor, (3) A process of carrying out vapor liquid separation of the treating solution of high temperature high pressure obtained at a process of the above (1), (4) After removing sludge and/or a metallic component from the liquid phase acquired at a process of the above (3), while mixing a part of liquid phase with said liquid waste and circulating to the first reactor, the remainder of the liquid phase — the following — a process fed into a process of (5), and (5) — in the second reactor, The gaseous phase acquired at the remainder of the liquid phase and a process of the above (3) which were removed in sludge and/or a metallic component at a process of the above (4), Maintaining at a pressure to which it is 0.1 cm/sec or more in liquid linear velocity (feeding volume / reactor cross-section area), and not less than 100 °C in temperature, and a treating solution maintains the liquid

with a process which carries out a catalyst wet oxidation process.

[0008]2. Concurrent processing method of organic solid waste given in above-mentioned paragraph 1 and liquid waste whose quantity of the liquid phase through which it circulates from process (4) to the first reactor is 5 or more times of quantity of the liquid phase fed by process (5) from process (4).

[0009]3. Concurrent processing method of organic solid waste given in above-mentioned paragraph 2 and liquid waste whose quantity of the liquid phase through which it circulates from process (4) to the first reactor is 10 to 20 times quantity of the liquid phase fed by process (5) from process (4).

[0010]A catalytic activity ingredient in a process (5) 4. Iron, cobalt, nickel, A concurrent processing method of organic solid waste given in either of the above-mentioned paragraphs 1-3 and liquid waste which are at least one sort chosen from a group which becomes water of a ruthenium, rhodium, palladium, iridium, platinum, copper, gold, tungsten, and these metal from an insoluble thru/or poorly soluble compound.

[0011]5. Concurrent processing method of organic solid waste given in either of above-mentioned paragraphs 1-4 which performs recovery of power and/or steam, or warm water from mixed gas of steam and exhaust gas which were separated from liquid at the second reactor exit, and liquid waste.

[0012]
[Embodiment of the Invention]As organic solid waste which this invention makes a processing object, plants, a bamboo, grass, straw, textiles, vegetable waste, rubber, a hide, etc. are illustrated. Especially as liquid waste, it is not limited but Aerobic treatment sludge, anaerobic-treatment sludge, Sludge, such as a sewage sludge; The domestic waste containing garbage, paper, a plastic, etc., The waste water containing organic matters, such as waste water by which it is generated with nightsoil, plating waste water, food factory waste water, paper mill waste water, pharmaceutical factory waste water, photograph waste water, printing waste water, agricultural-chemicals related waste water, dyeing waste water, semiconductor plant waste water, coal liquefaction, or gasification, and waste water by which it is generated in connection with the pyrolysis of municipal solid waste, etc. are illustrated. Such organic solid state wastes and liquid waste may mix and process each two or more sorts if needed.

[0013]Even if the organic solid state waste and/or liquid waste which this invention makes a processing object contain one sort of metallic components, such as Mg, aluminum, Si, P, Ca, Ti, Cr, Mn, Fe, Co, nickel, Cu, Zn, and Cd, or two sorts or more, they are still better.

[0014]The invention in this application is explained in detail, referring to Drawings below.

[0015]Drawing 1 is a flow plan which shows the outline of the invention in this application.

[0016]Oxygen containing gas, such as air by which pressure up of the liquid waste was carried out by the booster pump to the predetermined pressure, and pressure up was further carried out beforehand with the compressor, is mixed. Subsequently, after being heated by the temperature of not less than 100 °C by a heat exchanger, the first reactor (in order to distinguish from the second reactor that filled up below with the after-mentioned catalyst, it is called a void-tower reactor) is supplied with the below-mentioned circulation fluid phase.

[0017]On the other hand, as organic solid waste is shown in drawing 2, it is supplied to a void-tower reactor. That is, before the closing operation start of organic solid waste, the valves 1, 2, and 3 of the charging device are closed, the inside of a void-tower reactor is high voltage, and the inside of a charging device is ordinary pressure. After opening the valve 1 and feeding solid waste into a charging device with a closing operation start, the valve 1 is closed, the valve 3 is opened, and pressure up is carried out until it becomes at the same pressure with a void-tower reactor about the inside of a charging device by high pressure air. Subsequently, the valve 3 is closed, and the valve 2 is closed, after opening the valve 2 and throwing in the solid waste in a charging device in a void-tower reactor. Under the present circumstances, when the size of solid waste is too large, supply to a charging device is preceded, and it grinds thru/or crushes beforehand.

[0018]As a heat source of a heat exchanger, it may be used, circulating the hot treating solution of the second catalyst restoration reactor (in order to distinguish from the first void-tower reactor below, it is called a catalytic-reaction machine), or other heating methods may be used. The concentration of pollutants is low, and when predetermined reaction temperature is unmaintainable to reaction time in winter etc., or when you need the temperature up to a predetermined temperature, it can heat with a warmer (not shown) further, or can also supply a steam to a void-tower reactor from a steam generator (not shown). Also in order to make the degree of void-tower reactor internal temperature into prescribed temperature on the occasion of start-up, temperature up of the open steam can be fed and carried out into a void-tower reactor, or temperature up of the warmer (not

[0019]Not less than about 100 ** of temperature in the reaction (the first reaction) in a void-tower reactor is usually about 150-370 ** more preferably. The cracking severity of an organic matter etc. increases and the holding time of the processed material (liquid waste + organicity solid waste + circulation fluid phase) within a void-tower reactor is also shortened so that the temperature of reaction time is high, but. What is necessary is just to define the first reaction temperature synthetically in consideration of the pollutants concentration in a processed material, the grade of processing demanded, a running cost, construction costs, etc., since an installation cost increases on the other hand. The pressure of reaction time should just be more than the pressure to which a processed material can hold the liquid phase at prescribed temperature.

[0020]As for the amount of oxygen added by the processed material, more than the amount of theoretical oxygen required to disassemble a cyanide compound, a nitrogen compound, an organic nature substance, and an inorganic substance even into a harmless output is about 1.05 to 1.5 of the amount of theoretical oxygen times the amount more preferably.

[0021]Although the embodiment which uses air as an oxygen source was mentioned to [drawing 1](#), The oxygen content waste gas etc. which are not limited, in addition contain one sort, such as hydrogen cyanide, hydrogen sulfide, ammonia, a sulfur oxide, an organosulfur compound, nitrogen oxides, and hydrocarbon, or two sorts or more as oxygen enriched air, oxygen, and an impurity especially as an oxygen source are illustrated.

[0022]The amount of theoretical oxygen as used in this invention means "the amount of oxygen required to disassemble the cyanide compound, the nitrogen compound, organic nature substance, and inorganic substance (processed ingredient) in wet waste even into N_2 , H_2O , and CO_2 ." The amount of theoretical oxygen can be easily determined by analyzing the processed ingredient in the mixture (liquid waste + organicity solid waste + circulation fluid phase) made into a processing object, and computing the amount of theoretical oxygen required for those decomposition. Based on experience and some experiment, the expression of relations which can compute the amount of theoretical oxygen approximately in high accuracy can be found out practical using some parameters. Such an expression of relations is indicated by JP,S58-27999,B, for example.

[0023]Sludge with which it is mainly concerned sediments and deposits an inorganic compound on the void-tower reactor lower part with the passage of time. The deposited sludge is removable by closing the valve 4 and subsequently opening the valve 5, after opening the valve 4 of a void-tower reactor lower part and transporting the sludge liquid in a reactor to a desludging device so that [drawing 2](#) may show caudad. According to the kind of liquid waste, a steam can be supplied to a desludging device (when liquid waste is plating waste water and cyanogen is generated for example), and the cyanogen in sludge can be thoroughly decomposed into it. To a desludging device, the valve 5 is closed, after opening the valve 5 provided caudad and discharging sludge liquid, since sludge and/or a metallic component deposit gradually. Publicly known solid liquid separation treatment can be presented with sludge liquid, and separated liquid can be again circulated through and processed to a void-tower reactor with liquid waste. With such a lock hopper method, the sludge generated within the void-tower reactor can be extracted semi-continuously, and can be discharged. By removal of this sludge and/or a metallic component, adhesion for the catalyst in a following catalytic-reaction machine can be controlled, and high catalytic activity can be maintained over a long period of time.

[0024]It cannot be overemphasized that it is usable also in [drawing 1](#) or the void-tower reactor of later [drawing 4](#) in the desludging device shown in [drawing 2](#).

[0025]The first treating solution formed with the void-tower reactor is divided into the liquid phase and the gaseous phase.

[0026]An example of the gas liquid separation apparatus within a void-tower reactor is typically shown in [drawing 3](#). In the device of a graphic display, the gas liquid separation device provided with the four nozzles N-1, N-2, N-3, and N-4 is provided in the upper part of the void-tower reactor, and the vapor-liquid mixture (G+L) from the reactor lower part is separated by the part of the nozzle N-1. The gaseous phase G is led to a next process through the nozzle N-3 from the upper part or the nozzle N-2 of an oil level. On the other hand, the liquid phase L is led to a next process through the nozzle N-4 from the nozzle N-1. The separated liquid phase L is supplied to a solid-liquid separator, after removing solid content here, it is supplied to the gaseous phase G and the 2nd catalytic-reaction machine in all, and a secondary response is presented with it. In this invention, vapor liquid separation within a void-tower reactor can be performed using the device of arbitrary composition, as long as the purpose is attained.

[0027]It is used in order to separate the solid by which precipitate removal was not carried out within

although a graphic display is not carried out, it is preferred to carry out 2 series installation, to change a valve, and to use it by turns. When installing the solid-liquid separator of two series, one series of a non-use state under ordinary pressure or application of pressure, It washes chemically (using drugs, such as for example, 5 to 10% nitric acid, and 5 to 10% sodium hydroxide), or is physical (a steam or high-pressure steam). [use and] Or sludge is removable out of a system by washing by moving a ceramic ball, a metal ball, etc. Since the solid content in the liquid phase from a void-tower reactor is effectively removable by using a solid-liquid separator, it is stabilized, the activity of the catalyst with which it filled up in the catalytic-reaction machine can be made to be able to maintain over a long period of time, and the life can be made to extend.

[0028]After supplying the liquid phase to a solid-liquid separator and removing a solid here, it circulates through a part to a void-tower reactor with liquid waste, and the remainder is supplied to the gaseous phase and the second catalytic-reaction machine in all, and a secondary response is presented with it.

[0029]The quantity of the liquid phase through which it circulates from a solid-liquid separator to a void-tower reactor is about (the ratio of this circulating load/amount of feeding is preferably said as a circulation ratio to below, about 10 to 20 times) 5 or more times of the quantity of the liquid phase fed into a catalytic-reaction machine from a solid-liquid separator. A solubilization reaction within a void-tower reactor can be promoted, the activity of the catalyst with which it filled up in the catalytic-reaction machine can be made to be able to maintain over a long period of time more by circulation of this liquid phase that still contains the solid content which is not decomposed [a little], and that life can be made to extend further further.

[0030]When a lot of alkali metal compounds originating in liquid waste and/or organic solid waste are contained in the liquid phase fed by the catalytic-reaction machine from a solid-liquid separator, By adding about 0.25-0.55 times the amount per alkaline metal total quantity of 1 mol in the liquid phase of sulfuric acid, it is preferred to perform the pH adjustment. By this sulfuric acid addition, generation of the nitrogen compound (especially NO_2 voice nitrogen and NO_3 voice nitrogen) in a catalytic-reaction machine can also be controlled. The substance (for example, sulfur compounds, such as sulfur and ammonium thiosulfate) which replaces with sulfuric acid or can generate sulfuric acid under the reaction condition in a catalytic-reaction machine with sulfuric acid may be added. In this invention, the term of "sulfuric acid" shall include these "sulfuric acid morphogenetic substances."

[0031]Even if it faces a secondary response, pollutants concentration is low, when predetermined reaction temperature is unmaintainable to reaction time in winter etc., it can heat with a warmer (not shown) or a steam can also be supplied to a catalytic-reaction machine from a steam generator (not shown). In order to make the inside of a catalytic-reaction machine into prescribed temperature on the occasion of start-up, it circulates through the hot first treating solution of a void-tower reactor, and temperature up is performed, or a steam is directly fed into a catalytic-reaction machine, temperature up can be performed or a warmer (not shown) can also perform temperature up.

[0032]The difference with a void-tower reactor and a catalytic-reaction machine exists in the point that the liquid linear velocity in the point and the latter with which the catalyst supported by the carrier in the latter is filled up is 0.1 cm/sec or more.

[0033]As a catalytic activity ingredient, the compound of the insoluble in water nature of iron, cobalt, nickel, a ruthenium, rhodium, palladium, iridium, platinum, copper, gold, tungsten, and these metal thru/or damage-at-sea solubility is mentioned. As a more concrete example of such a compound, oxides (cobalt oxide, iron oxide, etc.), chlorides (ruthenium dichloride, a platinum dichloride, etc.), sulfides (ruthenium sulfide and rhodium sulfide), etc. are mentioned. These metal and its compound may be used alone, or may use two or more sorts together. These catalytic activity ingredients are used in accordance with a conventional method in the state where it supported to a publicly known metallic-oxide carrier and metal carrier. Especially as a metallic-oxide carrier and a metal carrier, it is not limited but what is used can be used as publicly known catalyst support. As a metallic-oxide carrier, alumina, silica, zirconia, a titania, The metallic-oxide system carrier etc. which use as the main ingredients the composite metal oxides (alumina silica, alumina silica zirconia, titania zirconia, etc.) containing these metallic oxides, these metallic oxides, or a composite metal oxide are mentioned, and iron, aluminum, etc. can mention as a metal carrier. In these carriers, zirconia, a titania, and titania zirconia excellent in endurance are more preferred.

[0034]The shape of a carried catalyst is not limited in particular, either, but a globular shape, a pellet type, cylindrical shape, the shape of a spall, powder, honeycomb shape, etc. are mentioned. In the case of the fixed bed, the reactor capacity in the case of carrying out restoration use of such a

5-25 mm more preferably about 3-50 mm, when [which] powdered, a globular shape, a pellet type, cylindrical shape, the shape of a spall, and. As a honeycomb structured body in the case of supporting and using a catalyst for a honeycomb shape carrier, the thing of a quadrangle, a hexagon, and which arbitrary circular shape is used for an opening. Although the area per unit capacity, a numerical aperture in particular, etc. are not limited, $200 - 800\text{m}^2/\text{m}^3$, and the thing of about 40 to 80% of a numerical aperture are usually used as an area per unit capacity. The zirconia, the titania, and titania zirconia where the metallic oxide and metal same also as construction material of a honeycomb structured body as the above were illustrated and which were excellent in endurance are more preferred.

[0035]In making a fluid bed form within a catalytic-reaction machine, within a reactor, on the basis of the quantity which can form a fluid bed, i.e., the weight of the usual liquid phase, about 0.01 to 20%, a carried catalyst makes slurry form suspended to the liquid phase, and uses about 0.05 to 10% for it more preferably. In adopting a fluid bed, a carried catalyst is supplied to a catalytic-reaction machine in the state where slurry form was made suspended in the liquid phase, and from the second treating solution discharged out of the tower after ending reaction, separate recovery of the catalyst is carried out by suitable methods, such as sedimentation and centrifugal separation, and it carries out a reuse. Therefore, as for the particle diameter of the carried catalyst used in a fluid bed, if the ease of the separate recovery of the catalyst from the second treating solution is taken into consideration, it is more preferred to be referred to as about 0.15-0.5 mm. although the holding amount in particular of catalytic activity metal is not what is limited — usually — carrier weight — about 0.01 to 25% is in about 0.1 to 3% of within the limits more preferably.

[0036]The reaction temperature in a catalytic-reaction machine is not less than 100 **. Since the organic matter in a processed material is solubilized by the first processing in a void-tower reactor and reactivity is increasing, reaction temperature in a catalytic-reaction machine can be made lower not less than 10 ** than the reaction temperature in a void-tower reactor. In a void-tower reactor, since sludge and/or the metallic component which were contained in the processed material are removed efficiently and removal of solid content is further performed also in the solid-liquid separator, the activity of the catalyst with which the catalytic-reaction machine was filled up is prevented also from being checked.

[0037]After the treating solution (the second treating solution) from a catalytic-reaction machine is used as a source of heating of the raw water in a heat exchanger as mentioned above, it is sent to a gas liquid separation device through the heat recollection machine for collecting residual thermal energies as a steam and/or warm water, and is divided into the gaseous phase (exhaust gas) and the liquid phase (treated water).

[0038]Although a graphic display is not carried out, the liquid phase acquired from the second treating solution is further sent to a solid-liquid-separation machine in accordance with a conventional method, and if necessary, after removing the metal and/or the sludge ingredient which are contained in the liquid phase, it will serve as final-treatment liquid. As a separation method in a solid-liquid-separation machine, publicly known methods, such as separation by gravity settling, separation with a magnet, separation by the filter press, and separation by coagulation sedimentation, are employable.

[0039]Since the gaseous phase (exhaust gas) does not contain ammonia, nitrogen oxides, a sulfur oxide, dioxin, etc. substantially, it can be diffused to the atmosphere as it is.

[0040]In the 1st invention of an application concerned, as shown in drawing 4, the mixed gas of the steam and exhaust gas which were separated from liquid in the catalytic-reaction machine upper part can be led to power recovery devices, such as an expansion turbine, as it is, and power recovery can be performed. From hot and high-pressure exhaust gas and treating solution, heat recollection can also be performed with the gestalt of a steam. The power which exceeds the power consumption in an air compressor, a pump, etc. is recoverable with the power collected in these cases. In drawing 4, the description of the name is excluded about the same components (for example, void-tower reactor etc.) as drawing 1.

[0041]

[Effect of the Invention]According to this invention method, organic solid waste and liquid waste can be processed efficiently simultaneously.

[0042]Since ammonia, the nitrogen oxides, organic nature substance, and inorganic substance in liquid waste are also disassembled thoroughly substantially, the stable treatment effect is attained.

[0043]Existence of a detrimental constituent is substantially observed in neither the gaseous phase

constituent which originates in waste gas at any of the gaseous phase and the liquid phase is not accepted substantially.

[0045]The sludge formed is excellent in sedimentation nature, and easy handling.

[0046]Process control becomes easy while cleanup costs (an installation cost, a running cost, etc.) fall remarkably according to this invention method, since each process is carried out continuously, and the process flow is very easy.

[0047]Electric power and/or heat are efficiently recoverable from hot and high-pressure exhaust gas and treating solution.

[0048]

[Example]Working example and a comparative example are shown below, and the place by which it is characterized [of this invention] is clarified further.

[0049]According to the flow shown in working example 1 drawing 1, by the invention in this application, garbage (a constituent ratio is shown in Table 1), Plastic scrap wood (a constituent ratio is shown in Table 2), paper scrap wood (a constituent ratio is shown in Table 3), Other combustibles scrap wood (a constituent ratio to Table 4.) and it was shown, the processed material (10 % of the weight of solids concentration) which mixed further sewage-works waste water (which shows a presentation etc. in Table 7 — it is called raw water below) to solid waste mixture (the mixing ratio is shown in Table 6) 100 weight section which consists of sludge (a presentation etc. are shown in Table 5) was processed. Garbage was crushed with the disposer, and other solid waste was mixed after crushing beforehand by a crusher.

[0050]

[Table 1]

構 成 成 分	含有比 (%)
豚肉 (そのまま)	5. 0
いわし (頭、骨)	5. 0
卵 (殻)	5. 0
ジャガイモ (皮)	15. 0
キャベツ (そのまま)	30. 0
オレンジ (皮、袋、種)	20. 0
りんご (皮、芯)	15. 0
米飯 (そのまま)	5. 0

[0051]

[Table 2]

構 成 成 分	含有比 (%)
ポリエチレン	
袋	20. 0
マヨネーズ容器	20. 0
ポリプロピレン	
プリンカップ	10. 0
金属内張り菓子袋	10. 0
ポリスチレン	
カップ	10. 0
発泡トレイ	10. 0
ポリ塩化ビニリデン	
ラップ	20. 0

[0052]

[Table 3]

<u>構 成 成 分</u>	<u>含有比 (%)</u>
ティッシュペーパー	20.0
新聞紙	20.0
袋・包装紙	20.0
箱	20.0
内部被覆放料バック	20.0

[0053]

[Table 4]

<u>構成成分</u>	<u>含有比 (%)</u>
繊維片	66.6
木片	6.7
ゴム	6.7
皮革	20.0

[0054]

[Table 5]

<u>成 分</u>	<u>濃度 (mg/l)</u>
SS	35000
BOD	16000
Total-N	680

[0055]

[Table 6]

<u>廃棄物</u>	<u>混合割合 (%)</u>
厨 芥	9.5
プラスチック	18.2
紙	50.0
その他の可燃物	15.0
汚 泥	7.3

[0056]

[Table 7]

<u>成 分</u>	<u>濃度 (mg/l)</u>
BOD	250
SS	220
Total-N	20
NH ₄ -N	12

[0057] That is, the air which supplies raw water to a void-tower reactor with a pump again, and is equivalent to 1.1 times the amount of the amount of theoretical oxygen ($31.5 \text{ Nm}^3/\text{kl}$) from a compressor to the formed processed material ($2.2 \text{ m}^3/\text{m}^2/\text{hr}$) with a material input device in a solid waste mixture was supplied.

[0058] While introducing raw water and air into the entrance side of the heat exchanger when reacting, the second treating solution from a catalytic-reaction machine was sent to the heat exchanger, heat exchange was carried out to the vapor-liquid mixture, and temperature control was performed so that the temperature of the vapor-liquid mixture in the outlet side (entrance side of a void-tower reactor) of a heat exchanger might be 270°C . The inside of a void-tower reactor was held to the temperature of 270°C , and the pressure of $86 \text{ kg/cm}^2\text{G}$ by wet oxidation disassembly of the organic matter in a processed material.

[0059] Removal of sludge and/or the metallic component which are formed within a void-tower reactor. After opening the first valve provided in the lower part of the reactor and transporting the sludge liquid in a void-tower reactor to a desludging device, it carried out by closing the first valve,

[0060]Subsequently, after carrying out vapor liquid separation of the obtained first treating solution, the liquid phase (liquid phase-1) was led to the solid-liquid-separation machine, and solid content was removed.

[0061]Subsequently, while circulating through the great portion of liquid phase-2 ($22\text{m}^3/\text{m}^2/\text{hr}$), therefore a circulation ratio = 10 times) obtained by the above-mentioned solid liquid separation to a void-tower reactor, The emainder ($2.2\text{m}^3/\text{m}^2/\text{hr}$) was combined with the gaseous phase acquired by vapor liquid separation, and catalyst wet oxidation was supplied and carried out to the catalytic-reaction machine by liquid-space-velocity 0.67hr^{-1} (void-tower standard). While being filled up with the globular form catalyst (4-6 mm in diameter) which made the titania carrier support 2% of ruthenium of carrier weight in the catalytic-reaction machine, the temperature and the pressure of the inside were held almost identically to a void-tower reactor. The liquid linear velocity within a catalytic-reaction machine was 0.06 cm/sec .

[0062]The presentation of the second treating solution from liquid phase-1, liquid phase-2, and a catalytic-reaction machine, etc. are shown in Table 8.

[0063]

[Table 8]

液 性 状	液相-1	液相-2	二次処理液
p H	5. 4	5. 4	4. 6
B O D (mg/l)	8760	8530	< 1
C O D _{cr} (mg/l)	14500	12800	5
Total-N	3 5 5	3 3 9	6
NH ₄ -N	1 3 4	1 3 0	< 1
金属 (mg/l)	2550	1 2 0	4 5

[0064]Notes: The amount of metal in Table 8 shows the total quantity of aluminum, Fe, Ca, Mg, P, Mn, Zn, Cu, nickel, Cr, Pb, Cd, Sr, Ba, Co, and Mo.

[0065]Cadmium, chromium, lead, mercury, these compounds, etc. were not detected from the second treating solution. Exhaust gas consisted of O_2 , N_2 , and CO_2 substantially excluding ammonia, NO_x , SO_x , dioxin, etc.

[0066]The waste mixture was processed like working example 1 except changing various combination of the active ingredient/catalyst support of the catalyst with which working example 2 - 14 catalytic-reaction machine are filled up. A result is shown in Table 9.

[0067]

[Table 9]

実施例	活性成分/担体	B O D (mg/l)	NH ₄ -N (mg/l)
2	2%Rh/TiO ₂	1	< 1
3	2%Pd/TiO ₂	1	< 1
4	2%Ir/TiO ₂	1	< 1
5	0.5%Pt/TiO ₂	2	< 1
6	10%Co/ZrO ₂	6	3
7	10%Ni/TiO ₂	8	5
8	20%Mn+5%Se /TiO ₂	5	2
9	5%W/TiO ₂	9	7
10	5%Cu/TiO ₂	9	8
11	5%Fe/TiO ₂	11	9
12	1%Os/TiO ₂	3	< 1
13	1%Au/TiO ₂	2	< 1
14	15%Mg/TiO ₂	7	3

[0068]Also when the combination of the active ingredient/carrier of a catalyst is changed, in the wet oxidation process of a waste mixture, it is clear from the result shown in Table 9 that the outstanding

mixture may be 10%, according to the flow shown in drawing 4, the waste mixture was processed by the same reaction condition as working example 1.

[0070] That is, after performing wet oxidation of a waste mixture like working example 1, when the mixed gas of the steam and exhaust gas which were separated from the treating solution in the catalytic reaction tower upper part was led to the expansion turbine and power recovery was performed, the power which exceeds the power consumption in an air compressor, a booster pump, etc. was able to be collected.

[Translation done.]

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TECHNICAL FIELD

[Field of the Invention]this invention — organic solid waste (garbage, paper, a plastic, a piece of wood, and a bamboo piece.) It is related with the method of processing simultaneously the piece of grass, straw, textiles, vegetable pieces, rubber, a hide, etc. and liquid waste (sludge, such as aerobic treatment sludge, anaerobic-treatment sludge, and a sewage sludge; waste water, such as waste water from a domestic waste, a food factory, etc., and industrial waste water in which biological waste treatment contains a difficult ingredient etc.).

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EFFECT OF THE INVENTION

[Effect of the Invention]According to this invention method, organic solid waste and liquid waste can be processed efficiently simultaneously.

[0042]Since ammonia, the nitrogen oxides, organic nature substance, and inorganic substance in liquid waste are also disassembled thoroughly substantially, the stable treatment effect is attained.

[0043]Existence of a detrimental constituent is substantially observed in neither the gaseous phase after final vapor liquid separation, nor the liquid phase (final-treatment liquid).

[0044]When using oxygen content waste gas as an oxygen source, existence of the detrimental constituent which originates in waste gas at any of the gaseous phase and the liquid phase is not accepted substantially.

[0045]The sludge formed is excellent in sedimentation nature.

Handling is easy.

[0046]Process control becomes easy while cleanup costs (an installation cost, a running cost, etc.) fall remarkably according to this invention method, since each process is carried out continuously, and the process flow is very easy.

[0047]Electric power and/or heat are efficiently recoverable from hot and high-pressure exhaust gas and treating solution.

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TECHNICAL PROBLEM

[Description of the Prior Art]The solid waste which contains sludge, various waste water, and an organic matter conventionally is processed by the separate art according to each characteristic. [0003]For example, sludge is incinerated after drying or reclamation processing is carried out. After activated sludge treatment of the organic matter content waste water is carried out, the sludge to generate is destroyed by fire or reclamation processed as mentioned above. The solid waste containing an organic matter remains as it is, or is incinerated after desiccation. [0004]However, the yield of various kinds of [in recent years] wastes increases, and it is difficult to cope with it gradually in the method of processing individually by the above conventional technologies.

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MEANS

[Means for Solving the Problem] This invention person started research about art of processing sludge, various waste water, and organicity solid waste etc., in view of the actual condition of the above art. In the process, organic solid waste and liquid waste were mixed and it found out that above-mentioned SUBJECT could be mostly attained for this under a specific condition a wet oxidation process and when carrying out a catalyst wet oxidation process.

[0007] That is, this invention provides how to process following organic solid waste and liquid waste simultaneously;

(1. — the [1] — [in a reactor of one] — a liquid mixture of organic solid waste and liquid waste — temperature of not less than 100 °C — and, maintaining at a pressure which maintains the liquid phase. A process which carries out a wet oxidation process under existence of oxygen more than the amount of theoretical oxygen required to disassemble a cyanide compound, a nitrogen compound, an organic nature substance, and an inorganic substance in a liquid mixture, (2) A process of removing sludge and/or a metallic component which were generated at a process of the above (1) from the first reactor, (3) A process of carrying out vapor liquid separation of the treating solution of high temperature high pressure obtained at a process of the above (1), (4) After removing sludge and/or a metallic component from the liquid phase acquired at a process of the above (3), while mixing a part of liquid phase with said liquid waste and circulating to the first reactor, the remainder of the liquid phase — the following — a process fed into a process of (5), and (5) — in the second reactor, The gaseous phase acquired at the remainder of the liquid phase and a process of the above (3) which were removed in sludge and/or a metallic component at a process of the above (4), Maintaining at a pressure to which it is 0.1 cm/sec or more in liquid linear velocity (feeding volume / reactor cross-section area), and not less than 100 °C in temperature, and a treating solution maintains the liquid phase under existence of a catalyst which uses at least one sort of metal and metallic compounds as an active ingredient. A concurrent processing method of organic solid waste and liquid waste provided with a process which carries out a catalyst wet oxidation process.

[0008] 2. Concurrent processing method of organic solid waste given in above-mentioned paragraph 1 and liquid waste whose quantity of the liquid phase through which it circulates from process (4) to the first reactor is 5 or more times of quantity of the liquid phase fed by process (5) from process (4).

[0009] 3. Concurrent processing method of organic solid waste given in above-mentioned paragraph 2 and liquid waste whose quantity of the liquid phase through which it circulates from process (4) to the first reactor is 10 to 20 times quantity of the liquid phase fed by process (5) from process (4).

[0010] A catalytic activity ingredient in a process (5) 4. Iron, cobalt, nickel, A concurrent processing method of organic solid waste given in either of the above-mentioned paragraphs 1-3 and liquid waste which are at least one sort chosen from a group which becomes water of a ruthenium, rhodium, palladium, iridium, platinum, copper, gold, tungsten, and these metal from an insoluble thru/or poorly soluble compound.

[0011] 5. Concurrent processing method of organic solid waste given in either of above-mentioned paragraphs 1-4 which performs recovery of power and/or steam, or warm water from mixed gas of steam and exhaust gas which were separated from liquid at the second reactor exit, and liquid waste.

[0012]

[Embodiment of the Invention] As organic solid waste which this invention makes a processing object, plants, a bamboo, grass, straw, textiles, vegetable waste, rubber, a hide, etc. are illustrated. Especially as liquid waste, it is not limited but Aerobic treatment sludge, anaerobic-treatment sludge, Sludge, such as a sewage sludge: The domestic waste containing garbage, paper, a plastic etc. The waste

photograph waste water, printing waste water, agricultural-chemicals related waste water, dyeing waste water, semiconductor plant waste water, coal liquefaction, or gasification, and waste water by which it is generated in connection with the pyrolysis of municipal solid waste, etc. are illustrated. Such organic solid state wastes and liquid waste may mix and process each two or more sorts if needed.

[0013]Even if the organic solid state waste and/or liquid waste which this invention makes a processing object contain one sort of metallic components, such as Mg, aluminum, Si, P, Ca, Ti, Cr, Mn, Fe, Co, nickel, Cu, Zn, and Cd, or two sorts or more, they are still better.

[0014]The invention in this application is explained in detail, referring to Drawings below.

[0015]Drawing 1 is a flow plan which shows the outline of the invention in this application.

[0016]Oxygen containing gas, such as air by which pressure up of the liquid waste was carried out by the booster pump to the predetermined pressure, and pressure up was further carried out beforehand with the compressor, is mixed. Subsequently, after being heated by the temperature of not less than 100 °C by a heat exchanger, the first reactor (in order to distinguish from the second reactor that filled up below with the after-mentioned catalyst, it is called a void-tower reactor) is supplied with the below-mentioned circulation fluid phase.

[0017]On the other hand, as organic solid waste is shown in drawing 2, it is supplied to a void-tower reactor. That is, before the closing operation start of organic solid waste, the valves 1, 2, and 3 of the charging device are closed, the inside of a void-tower reactor is high voltage, and the inside of a charging device is ordinary pressure. After opening the valve 1 and feeding solid waste into a charging device with a closing operation start, the valve 1 is closed, the valve 3 is opened, and pressure up is carried out until it becomes at the same pressure with a void-tower reactor about the inside of a charging device by high pressure air. Subsequently, the valve 3 is closed, and the valve 2 is closed, after opening the valve 2 and throwing in the solid waste in a charging device in a void-tower reactor. Under the present circumstances, when the size of solid waste is too large, supply to a charging device is preceded, and it grinds thru/or crushes beforehand.

[0018]As a heat source of a heat exchanger, it may be used, circulating the hot treating solution of the second catalyst restoration reactor (in order to distinguish from the first void-tower reactor below, it is called a catalytic-reaction machine), or other heating methods may be used. The concentration of pollutants is low, and when predetermined reaction temperature is unmaintainable to reaction time in winter etc., or when you need the temperature up to a predetermined temperature, it can heat with a warmer (not shown) further, or can also supply a steam to a void-tower reactor from a steam generator (not shown). Also in order to make the degree of void-tower reactor internal temperature into prescribed temperature on the occasion of start-up, temperature up of the open steam can be fed and carried out into a void-tower reactor, or temperature up of the warmer (not shown) can also be formed and carried out between a heat exchanger and a void-tower reactor.

[0019]Not less than about 100 °C of temperature in the reaction (the first reaction) in a void-tower reactor is usually about 150-370 °C more preferably. The cracking severity of an organic matter etc. increases and the holding time of the processed material (liquid waste + organicity solid waste + circulation fluid phase) within a void-tower reactor is also shortened so that the temperature of reaction time is high, but. What is necessary is just to define the first reaction temperature synthetically in consideration of the pollutants concentration in a processed material, the grade of processing demanded, a running cost, construction costs, etc., since an installation cost increases on the other hand. The pressure of reaction time should just be more than the pressure to which a processed material can hold the liquid phase at prescribed temperature.

[0020]As for the amount of oxygen added by the processed material, more than the amount of theoretical oxygen required to disassemble a cyanide compound, a nitrogen compound, an organic nature substance, and an inorganic substance even into a harmless output is about 1.05 to 1.5 of the amount of theoretical oxygen times the amount more preferably.

[0021]Although the embodiment which uses air as an oxygen source was mentioned to drawing 1, The oxygen content waste gas etc. which are not limited, in addition contain one sort, such as hydrogen cyanide, hydrogen sulfide, ammonia, a sulfur oxide, an organosulfur compound, nitrogen oxides, and hydrocarbon, or two sorts or more as oxygen enriched air, oxygen, and an impurity especially as an oxygen source are illustrated.

[0022]The amount of theoretical oxygen as used in this invention means "the amount of oxygen required to disassemble the cyanide compound, the nitrogen compound, organic nature substance, and inorganic substance (processed ingredient) in wet waste even into N_2 , H_2O , and CO_2 ." The

and computing the amount of theoretical oxygen required for those decomposition. Based on experience and some experiment, the expression of relations which can compute the amount of theoretical oxygen approximately in high accuracy can be found out practical using some parameters. Such an expression of relations is indicated by JP, S58-27999, B, for example.

[0023] Sludge with which it is mainly concerned sediments and deposits an inorganic compound on the void-tower reactor lower part with the passage of time. The deposited sludge is removable by closing the valve 4 and subsequently opening the valve 5, after opening the valve 4 of a void-tower reactor lower part and transporting the sludge liquid in a reactor to a desludging device so that drawing 2 may show caudad. According to the kind of liquid waste, a steam can be supplied to a desludging device (when liquid waste is plating waste water and cyanogen is generated for example), and the cyanogen in sludge can be thoroughly decomposed into it. To a desludging device, the valve 5 is closed, after opening the valve 5 provided caudad and discharging sludge liquid, since sludge and/or a metallic component deposit gradually. Publicly known solid liquid separation treatment can be presented with sludge liquid, and separated liquid can be again circulated through and processed to a void-tower reactor with liquid waste. With such a lock hopper method, the sludge generated within the void-tower reactor can be extracted semi-continuously, and can be discharged. By removal of this sludge and/or a metallic component, adhesion for the catalyst in a following catalytic-reaction machine can be controlled, and high catalytic activity can be maintained over a long period of time.

[0024] It cannot be overemphasized that it is usable also in drawing 1 or the void-tower reactor of later drawing 4 in the desludging device shown in drawing 2.

[0025] The first treating solution formed with the void-tower reactor is divided into the liquid phase and the gaseous phase.

[0026] An example of the gas liquid separation apparatus within a void-tower reactor is typically shown in drawing 3. In the device of a graphic display, the gas liquid separation device provided with the four nozzles N-1, N-2, N-3, and N-4 is provided in the upper part of the void-tower reactor, and the vapor-liquid mixture (G+L) from the reactor lower part is separated by the part of the nozzle N-1. The gaseous phase G is led to a next process through the nozzle N-3 from the upper part or the nozzle N-2 of an oil level. On the other hand, the liquid phase L is led to a next process through the nozzle N-4 from the nozzle N-1. The separated liquid phase L is supplied to a solid-liquid separator, after removing solid content here, it is supplied to the gaseous phase G and the 2nd catalytic-reaction machine in all, and a secondary response is presented with it. In this invention, vapor liquid separation within a void-tower reactor can be performed using the device of arbitrary composition, as long as the purpose is attained.

[0027] It is used in order to separate the solid by which precipitate removal was not carried out within the void-tower reactor, and a solid-liquid separator is independent, or a ceramic filter, a metallic filter, a cyclone system, etc. are used for it, combining them suitably. As for a solid-liquid separator, although a graphic display is not carried out, it is preferred to carry out 2 series installation, to change a valve, and to use it by turns. When installing the solid-liquid separator of two series, one series of a non-use state under ordinary pressure or application of pressure, It washes chemically (using drugs, such as for example, 5 to 10% nitric acid, and 5 to 10% sodium hydroxide), or is physical (a steam or high-pressure steam). [use and] Or sludge is removable out of a system by washing by moving a ceramic ball, a metal ball, etc. Since the solid content in the liquid phase from a void-tower reactor is effectively removable by using a solid-liquid separator, it is stabilized, the activity of the catalyst with which it filled up in the catalytic-reaction machine can be made to be able to maintain over a long period of time, and the life can be made to extend.

[0028] After supplying the liquid phase to a solid-liquid separator and removing a solid here, it circulates through a part to a void-tower reactor with liquid waste, and the remainder is supplied to the gaseous phase and the second catalytic-reaction machine in all, and a secondary response is presented with it.

[0029] The quantity of the liquid phase through which it circulates from a solid-liquid separator to a void-tower reactor is about (the ratio of this circulating load/amount of feeding is preferably said as a circulation ratio to below; about 10 to 20 times) 5 or more times of the quantity of the liquid phase fed into a catalytic-reaction machine from a solid-liquid separator. A solubilization reaction within a void-tower reactor can be promoted, the activity of the catalyst with which it filled up in the catalytic-reaction machine can be made to be able to maintain over a long period of time more by circulation of this liquid phase that still contains the solid content which is not decomposed [a little], and that life can be made to extend further further.

[0030] When a lot of alkali metal compounds originating in liquid waste, and (an organic solid waste, and

adding about 0.25–0.55 times the amount per alkaline metal total quantity of 1 mol in the liquid phase of sulfuric acid, it is preferred to perform the pH adjustment. By this sulfuric acid addition, generation of the nitrogen compound (especially NO_2 voice nitrogen and NO_3 voice nitrogen) in a catalytic-reaction machine can also be controlled. The substance (for example, sulfur compounds, such as sulfur and ammonium thiosulfate) which replaces with sulfuric acid or can generate sulfuric acid under the reaction condition in a catalytic-reaction machine with sulfuric acid may be added. In this invention, the term of "sulfuric acid" shall include these "sulfuric acid morphogenetic substances."

[0031] Even if it faces a secondary response, pollutants concentration is low, when predetermined reaction temperature is unmaintainable to reaction time in winter etc., it can heat with a warmer (not shown) or a steam can also be supplied to a catalytic-reaction machine from a steam generator (not shown). In order to make the inside of a catalytic-reaction machine into prescribed temperature on the occasion of start-up, it circulates through the hot first treating solution of a void-tower reactor, and temperature up is performed, or a steam is directly fed into a catalytic-reaction machine, temperature up can be performed or a warmer (not shown) can also perform temperature up.

[0032] The difference with a void-tower reactor and a catalytic-reaction machine exists in the point that the liquid linear velocity in the point and the latter with which the catalyst supported by the carrier in the latter is filled up is 0.1 cm/sec or more.

[0033] As a catalytic activity ingredient, the compound of the insoluble in water nature of iron, cobalt, nickel, a ruthenium, rhodium, palladium, iridium, platinum, copper, gold, tungsten, and these metal thru/or damage-at-sea solubility is mentioned. As a more concrete example of such a compound, oxides (cobalt oxide, iron oxide, etc.), chlorides (ruthenium dichloride, a platinum dichloride, etc.), sulfides (ruthenium sulfide and rhodium sulfide), etc. are mentioned. These metal and its compound may be used alone, or may use two or more sorts together. These catalytic activity ingredients are used in accordance with a conventional method in the state where it supported to a publicly known metallic-oxide carrier and metal carrier. Especially as a metallic-oxide carrier and a metal carrier, it is not limited but what is used can be used as publicly known catalyst support. As a metallic-oxide carrier, alumina, silica, zirconia, a titania, The metallic-oxide system carrier etc. which use as the main ingredients the composite metal oxides (alumina silica, alumina silica zirconia, titania zirconia, etc.) containing these metallic oxides, these metallic oxides, or a composite metal oxide are mentioned, and iron, aluminum, etc. can mention as a metal carrier. In these carriers, zirconia, a titania, and titania zirconia excellent in endurance are more preferred.

[0034] The shape of a carried catalyst is not limited in particular, either, but a globular shape, a pellet type, cylindrical shape, the shape of a spall, powder, honeycomb shape, etc. are mentioned. In the case of the fixed bed, the reactor capacity in the case of carrying out restoration use of such a carried catalyst is good to make it 0.5 – a 10hr^{-1} grade, and the space velocity of liquid turn into 1 – a 5hr^{-1} grade more preferably. The size of the carried catalyst used in the fixed bed is usually about 5–25 mm more preferably about 3–50 mm, when [which] powdered, a globular shape, a pellet type, cylindrical shape, the shape of a spall, and. As a honeycomb structured body in the case of supporting and using a catalyst for a honeycomb shape carrier, the thing of a quadrangle, a hexagon, and which arbitrary circular shape is used for an opening. Although the area per unit capacity, a numerical aperture in particular, etc. are not limited, $200 - 800\text{m}^2/\text{m}^3$, and the thing of about 40 to 80% of a numerical aperture are usually used as an area per unit capacity. The zirconia, the titania, and titania zirconia where the metallic oxide and metal same also as construction material of a honeycomb structured body as the above were illustrated and which were excellent in endurance are more preferred.

[0035] In making a fluid bed form within a catalytic-reaction machine, within a reactor, on the basis of the quantity which can form a fluid bed, i.e., the weight of the usual liquid phase, about 0.01 to 20%, a carried catalyst makes slurry form suspended to the liquid phase, and uses about 0.05 to 10% for it more preferably. In adopting a fluid bed, a carried catalyst is supplied to a catalytic-reaction machine in the state where slurry form was made suspended in the liquid phase, and from the second treating solution discharged out of the tower after ending reaction, separate recovery of the catalyst is carried out by suitable methods, such as sedimentation and centrifugal separation, and it carries out a reuse. Therefore, as for the particle diameter of the carried catalyst used in a fluid bed, if the ease of the separate recovery of the catalyst from the second treating solution is taken into consideration, it is more preferred to be referred to as about 0.15–0.5 mm. although the holding amount in particular of catalytic activity metal is not what is limited — usually — carrier weight — about 0.01 to 25% is in about 0.1 to 2% of within the limits more preferably.

organic matter in a processed material is solubilized by the first processing in a void-tower reactor and reactivity is increasing, reaction temperature in a catalytic-reaction machine can be made lower not less than 10 °C than the reaction temperature in a void-tower reactor. In a void-tower reactor, since sludge and/or the metallic component which were contained in the processed material are removed efficiently and removal of solid content is further performed also in the solid-liquid separator, the activity of the catalyst with which the catalytic-reaction machine was filled up is prevented also from being checked.

[0037] After the treating solution (the second treating solution) from a catalytic-reaction machine is used as a source of heating of the raw water in a heat exchanger as mentioned above, it is sent to a gas liquid separation device through the heat recollection machine for collecting residual thermal energies as a steam and/or warm water, and is divided into the gaseous phase (exhaust gas) and the liquid phase (treated water).

[0038] Although a graphic display is not carried out, the liquid phase acquired from the second treating solution is further sent to a solid-liquid-separation machine in accordance with a conventional method, and if necessary, after removing the metal and/or the sludge ingredient which are contained in the liquid phase, it will serve as final-treatment liquid. As a separation method in a solid-liquid-separation machine, publicly known methods, such as separation by gravity settling, separation with a magnet, separation by the filter press, and separation by coagulation sedimentation, are employable.

[0039] Since the gaseous phase (exhaust gas) does not contain ammonia, nitrogen oxides, a sulfur oxide, dioxin, etc. substantially, it can be diffused to the atmosphere as it is.

[0040] In the 1st invention of an application concerned, as shown in drawing 4, the mixed gas of the steam and exhaust gas which were separated from liquid in the catalytic-reaction machine upper part can be led to power recovery devices, such as an expansion turbine, as it is, and power recovery can be performed. From hot and high-pressure exhaust gas and treating solution, heat recollection can also be performed with the gestalt of a steam. The power which exceeds the power consumption in an air compressor, a pump, etc. is recoverable with the power collected in these cases. In drawing 4, the description of the name is excluded about the same components (for example, void-tower reactor etc.) as drawing 1.

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EXAMPLE

[Example] Working example and a comparative example are shown below, and the place by which it is characterized [of this invention] is clarified further.

[0049] According to the flow shown in working example 1 drawing 1, by the invention in this application, garbage (a constituent ratio is shown in Table 1), Plastic scrap wood (a constituent ratio is shown in Table 2), paper scrap wood (a constituent ratio is shown in Table 3), Other combustibles scrap wood (a constituent ratio to Table 4.) and it was shown, the processed material (10 % of the weight of solids concentration) which mixed further sewage-works waste water (; which shows a presentation etc. in Table 7 — it is called raw water below) to solid waste mixture (the mixing ratio is shown in Table 6) 100 weight section which consists of sludge (a presentation etc. are shown in Table 5) was processed. Garbage was crushed with the disposer, and other solid waste was mixed after crushing beforehand by a crusher.

[0050]

[Table 1]

構 成 成 分	含有比 (%)
豚肉 (そのまま)	5. 0
いわし (頭、骨)	5. 0
卵 (殻)	5. 0
ジャガイモ (皮)	15. 0
キャベツ (そのまま)	30. 0
オレンジ (皮、袋、種)	20. 0
りんご (皮、芯)	15. 0
米飯 (そのまま)	5. 0

[0051]

[Table 2]

構 成 成 分	含有比 (%)
ポリエチレン	
袋	20. 0
マヨネーズ容器	20. 0
ポリプロピレン	
プリンカップ	10. 0
金属内張り菓子袋	10. 0
ポリスチレン	
カップ	10. 0
発泡トレイ	10. 0
ポリ塩化ビニリデン	
ラップ	20. 0

[0052]

[Table 3]

<u>構 成 成 分</u>	<u>含有比 (%)</u>
ティッシュペーパー	20.0
新聞紙	20.0
袋+包装紙	20.0
箱	20.0
内部被覆飲料パック	20.0

[0053]

[Table 4]

<u>構成成分</u>	<u>含有比 (%)</u>
繊維片	66.6
木片	6.7
ゴム	6.7
皮革	20.0

[0054]

[Table 5]

<u>成 分</u>	<u>濃度 (mg/l)</u>
SS	35000
BOD	16000
Total-N	680

[0055]

[Table 6]

<u>廃 棄 物</u>	<u>混合割合 (%)</u>
厨 芥	9.5
プラスチック	18.2
紙	50.0
その他の可燃物	15.0
汚 泥	7.3

[0056]

[Table 7]

<u>成 分</u>	<u>濃度 (mg/l)</u>
BOD	250
SS	220
Total-N	20
NH ₄ -N	12

[0057] That is, the air which supplies raw water to a void-tower reactor with a pump again, and is equivalent to 1.1 times the amount of the amount of theoretical oxygen ($31.5 \text{ Nm}^3/\text{kl}$) from a compressor to the formed processed material ($2.2 \text{ m}^3/\text{m}^2/\text{hr}$) with a material input device in a solid waste mixture was supplied.

[0058] While introducing raw water and air into the entrance side of the heat exchanger when reacting, the second treating solution from a catalytic-reaction machine was sent to the heat exchanger, heat exchange was carried out to the vapor-liquid mixture, and temperature control was performed so that the temperature of the vapor-liquid mixture in the outlet side (entrance side of a void-tower reactor) of a heat exchanger might be 270°C . The inside of a void-tower reactor was held to the temperature of 270°C , and the pressure of 86 kg and cm^{-2}G by wet oxidation disassembly of the organic matter in a processed material.

[0059] Removal of sludge and/or the metallic component which are formed within a void-tower reactor. After opening the first valve provided in the lower part of the reactor and transporting the sludge liquid in a void-tower reactor to a desludging device, it carried out by closing the first valve,

[0060] Subsequently, after carrying out vapor liquid separation of the obtained first treating solution, the liquid phase (liquid phase-1) was led to the solid-liquid-separation machine, and solid content was removed.

[0061] Subsequently, while circulating through the great portion of liquid phase-2 ($22\text{m}^3/\text{m}^2/\text{hr}$., therefore a circulation ratio = 10 times) obtained by the above-mentioned solid liquid separation to a void-tower reactor, The emairder ($2.2\text{m}^3/\text{m}^2/\text{hr}$) was combined with the gaseous phase acquired by vapor liquid separation, and catalyst wet oxidation was supplied and carried out to the catalytic-reaction machine by liquid-space-velocity 0.67hr^{-1} (void-tower standard). While being filled up with the globular form catalyst (4-6 mm in diameter) which made the titania carrier support 2% of ruthenium of carrier weight in the catalytic-reaction machine, the temperature and the pressure of the inside were held almost identically to a void-tower reactor. The liquid linear velocity within a catalytic-reaction machine was 0.06 cm/sec .

[0062] The presentation of the second treating solution from liquid phase-1, liquid phase-2, and a catalytic-reaction machine, etc. are shown in Table 8.

[0063]

[Table 8]

液 性 状	液相-1	液相-2	二次处理液
pH	5.4	5.4	4.6
BOD (mg/l)	8760	8530	< 1
COD _{Cr} (mg/l)	14500	12800	5
Total-N	355	339	6
NH ₄ -N	134	130	< 1
金属 (mg/l)	2550	120	45

[0064] Notes: The amount of metal in Table 8 shows the total quantity of aluminum, Fe, Ca, Mg, P, Mn, Zn, Cu, nickel, Cr, Pb, Cd, Sr, Ba, Co, and Mo.

[0065] Cadmium, chromium, lead, mercury, these compounds, etc. were not detected from the second treating solution. Exhaust gas consisted of O₂, N₂, and CO₂ substantially excluding ammonia, NO_x, SO_x, dioxin, etc.

[0066] The waste mixture was processed like working example 1 except changing various combination of the active ingredient/catalyst support of the catalyst with which working example 2 - 14 catalytic-reaction machine are filled up. A result is shown in Table 9.

[0067]

[Table 9]

実施例	活性成分/担体	BOD (mg/l)	NH ₄ -N (mg/l)
2	2%Rh/TiO ₂	1	< 1
3	2%Pd/TiO ₂	1	< 1
4	2%Ir/TiO ₂	1	< 1
5	0.5%Pt/TiO ₂	2	< 1
6	10%Co/ZrO ₂	6	3
7	10%Ni/TiO ₂	8	5
8	20%Mn+5%Se /TiO ₂	5	2
9	5%W/TiO ₂	9	7
10	5%Cu/TiO ₂	9	8
11	5%Fe/TiO ₂	11	9
12	1%Os/TiO ₂	3	< 1
13	1%Au/TiO ₂	2	< 1
14	15%Mo/TiO ₂	7	3

[0068] Also when the combination of the active ingredient/carrier of a catalyst is changed, in the wet oxidation process of a waste mixture, it is clear from the result shown in Table 9 that the outstanding

mixture may be 10%, according to the flow shown in drawing 4, the waste mixture was processed by the same reaction condition as working example 1.

[0070] That is, after performing wet oxidation of a waste mixture like working example 1, when the mixed gas of the steam and exhaust gas which were separated from the treating solution in the catalytic reaction tower upper part was led to the expansion turbine and power recovery was performed, the power which exceeds the power consumption in an air compressor, a booster pump, etc. was able to be collected.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1]It is a flow plan which shows the outline of the invention in this application.

[Drawing 2]It is a flow plan which shows the outline of the feed mechanism of the solid waste to the void-tower reactor used in the invention in this application, and a desludging mechanism.

[Drawing 3]It is a mimetic diagram showing the outline of an example of the gas liquid separation apparatus installed in the void-tower reactor.

[Drawing 4]It is a flow plan which shows the outline in the case of performing power recovery in the invention in this application.

[Description of Notations]

- 1 -- Supply control valve of solid waste
- 2 -- Supply control valve from a material input device to a void-tower reactor
- 3 -- Supply control valve of high pressure air
- 4 -- Desludging control valve from a void-tower reactor
- 5 -- Desludging control valve from a desludging device
- N-1 -- Nozzle
- N-2 -- Nozzle
- N-3 -- Nozzle
- N-4 -- Nozzle

[Translation done.]

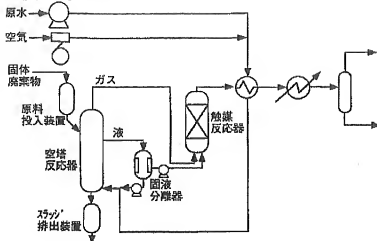
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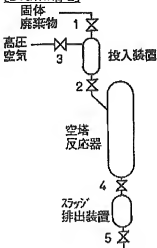
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DRAWINGS

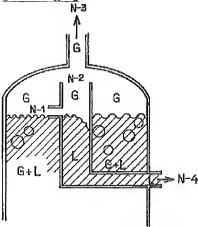
[Drawing 1]

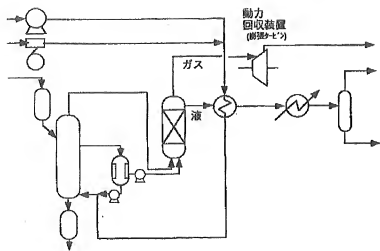


[Drawing 2]



[Drawing 3]





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CORRECTION OR AMENDMENT

[Kind of official gazette]Printing of amendment by regulation of Patent Law Article 17 of 2
[Section Type] The 1st Type of the part II gate
[Publication date]Heisei 11(1999) (1999) July 6

[Publication No.]JP,9-201590,A
[Date of Publication]Heisei 9(1997) (1997) August 5
[Annual volume number] Publication of patent applications 9-2016
[Application number]Japanese Patent Application No. 8-12230
[International Patent Classification (6th Edition)]

C02F 1/74 101

B01J 21/10

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23/44

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23/75

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B09B 5/00 ZAB

C02F 1/58 CDC

CDH

CDV

11/08 ZAB

[FI]

C02F 1/74 101

B01J 21/10 M

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23/44 M

23/46 M

301 M

23/52 M

23/72 M

27/057 M

C02F 1/58 CDC N

CDH P

CDV A

11/08 ZAB

B01J 23/74 301 M

311 M

321 M

B09B 5/00 ZAB M

[Written Amendment]

[Filing date]Heisei 10(1998) May 13

[Amendment 1]

[Document to be Amended]Description

[Item(s) to be Amended]Claims

[Method of Amendment]Change

[Proposed Amendment]

[Claim(s)]

[Claim 1](1) [in the first reactor] — a liquid mixture of organic solid waste and liquid waste — temperature of not less than 100 °C — and, maintaining at a pressure which maintains the liquid phase. A process which carries out a wet oxidation process under existence of oxygen more than the amount of theoretical oxygen required to disassemble a cyanide compound, a nitrogen compound, an organic nature substance, and an inorganic substance in a liquid mixture, (2) A process of removing sludge and/or a metallic component which were generated at a process of the above (1) from the first reactor, (3) A process of carrying out vapor liquid separation of the treating solution of high temperature high pressure obtained at a process of the above (1), (4) After removing sludge and/or a metallic component from the liquid phase acquired at a process of the above (3), while mixing a part of liquid phase with said liquid waste and circulating to the first reactor, the remainder of the liquid phase — the following — a process fed into a process of (5), and (5) — in the second reactor. The gaseous phase acquired at the remainder of the liquid phase and a process of the above (3) which were removed in sludge and/or a metallic component at a process of the above (4), Maintaining at a pressure to which it is 0.1 cm/sec or more in liquid linear velocity (feeding volume / reactor cross-section area), and not less than 100 °C in temperature, and a treating solution maintains the liquid phase under existence of a catalyst which uses at least one sort of metal and metallic compounds as an active ingredient. A concurrent processing method of organic solid waste and liquid waste provided with a process which carries out a catalyst wet oxidation process.

[Claim 2]A concurrent processing method of organic solid waste according to claim 1 and liquid waste whose quantity of the liquid phase through which it circulates from a process (4) to the first reactor is 5 or more times of quantity of the liquid phase fed by process (5) from a process (4).

[Claim 3]A concurrent processing method of organic solid waste according to claim 2 and liquid waste whose quantity of the liquid phase through which it circulates from a process (4) to the first reactor is 10 to 20 times the quantity of the liquid phase fed by process (5) from a process (4).

which are at least one sort chosen from a group which becomes water of rhodium, palladium, iridium, platinum, copper, gold, tungsten, and these metal from an insoluble thru/or poorly soluble compound.

[Claim 5] A concurrent processing method of of organic solid waste according to any one of claims 1 to 4 and liquid waste which perform recovery of power and/or a steam, or warm water from mixed gas of a steam and exhaust gas which were separated from liquid at the second reactor exit.

[Claim 6] Face supplying organic solid waste in the first reactor, and waste is introduced by making into ordinary pressure an inside of a solid waste charging device with which the first reactor was equipped, Subsequently, a concurrent processing method of of organic solid waste according to any one of claims 1 to 5 and liquid waste which supply waste in the first reactor from a charging device in the state of pressure up after carrying out pressure up of the inside of a charging device to the same pressure as inside of the first reactor.

[Translation done.]